

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

9/30/03

**RCRA Corrective Action  
Environmental Indicator (EI) RCRIS code (CA725)**

**Current Human Exposures Under Control**

Facility Name: BASF Fibers Plant  
Facility Address: 8961 Pocohontas Trail, Williamsburg, Virginia 23185  
Facility EPA ID #: VA990710642

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       if data are not available skip to #6 and enter "IN" (more information needed) status code.

**BACKGROUND**

**Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

**Definition of "Current Human Exposures Under Control" EI**

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

**Relationship of EI to Final Remedies**

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

**Duration / Applicability of EI Determinations**

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"<sup>1</sup> above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u>X</u>	___	___	<b>See Attachment 1</b>
Air (indoors) <sup>2</sup>	___	<u>X</u>	___	<b>See Attachment 1</b>
Surface Soil (<2 ft)	<u>X</u>	___	___	<b>See Attachment 1</b>
Surface Water	___	<u>X</u>	___	<b>See Attachment 1</b>
Sediment	___	___	___	
Subsurf. Soil (>2 ft)	<u>X</u>	___	___	<b>See Attachment 1</b>
Air (outdoors)	___	<u>X</u>	___	<b>See Attachment 1</b>

\_\_\_\_\_ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

X\_\_\_\_\_ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

\_\_\_\_\_ If unknown (for any media) - skip to #6 and enter "IN" status code.

**Rationale and Reference(s):**\_\_

**See Attachment 1**

Footnotes:

<sup>1</sup> "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

<sup>2</sup> Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

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3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

<b><u>"Contaminated" Media</u></b>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food <sup>3</sup>
Groundwater	N	Y	N	Y	Y	N	N
<del>Air (indoors)</del>							
Soil (surface, e.g., <2 ft)	N	Y	N	Y	Y	N	N
<del>Surface Water</del>							
Soil (subsurface e.g., >2 ft)	N	N	N	Y	N	N	N
<del>Air (outdoors)</del>							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.
2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("\_\_\_"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

\_\_\_\_\_ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

**X**\_\_\_\_\_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

\_\_\_\_\_ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

**See Attachment 2**

<sup>3</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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- 4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**<sup>4</sup> (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

  X   If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

       If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

       If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

**See Attachment 3**

<sup>4</sup> If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

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5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

\_\_\_\_\_ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

\_\_\_\_\_ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

\_\_\_\_\_ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

**Not Applicable**

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

IN - More information is needed to make a determination.

Supervisor (Original signed) Date 9/30/03  
Leslie Romanchik  
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**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**

## ATTACHMENT 1

**Groundwater:** Groundwater monitoring activities conducted at the facility have identified the presence of tetrachloroethene (PCE) in groundwater in an area approximately 1,200 ft. long by 600 ft. wide. The impacted area extends from the Manufacturing Area west through the Office Area towards the James River. Zinc was also detected at elevated concentrations in three areas: the area corresponding with the PCE impacts; the Wastewater Treatment Plant; and the Main Landfill.

Table 1 summarizes the results of the annual 2002 sampling event for PCE, trichloroethene (TCE), cis-1,2-dichloroethene, (cis-1,2-DCE), vinyl chloride (VC), and zinc.

**Surface and Subsurface Soils :** A Site Characterization Investigation was performed at the site in 2001 in order to characterize the nature and extent of soil and groundwater contamination at the site and to determine if there were indoor air concerns at the site. A supplemental soils investigation was performed and a report summarizing the data prepared (*Supplemental Soil Investigation Report, BASF Corporation, Williamsburg, Virginia*, September 15, 2003). A risk assessment (*Site-Wide Soil Risk Assessment, BASF Corporation, Williamsburg, Virginia*, September 15, 2003) was prepared based on the data generated from the site investigations. The soils were screened against the VDEQ Voluntary Remediation Guidance (VRP) Tier II residential soil screening level. Table 2 provides a comparison between VRP Tier II residential soil screening levels and EPA Region III Residential and Industrial Risk Based Screening Levels (RBCs). The comparison demonstrates that the Region III Residential and Industrial Soil RBCs are either equivalent or higher to the VDEQ VRP Tier II residential soil screening levels. The maximum Volatile Organic Compounds (VOC) detected and corresponding Region III Industrial and Residential RBCs are summarized in Table 3. Acronitrile was the only VOC to have a maximum detected concentration exceeding the Region III Industrial RBC. However, the average concentration and 95th percent upper confidence limit were both below the Region III Industrial RBC. For the purposes of the environmental investigations, the site was grouped into 12 areas. The results of the investigation for each of the areas are summarized below.

- **Main Industrial Area:** Four shallow soil samples (0 -1 ft) in the Main Industrial Area had Aroclor-1254 concentrations exceeding EPA Region III Residential RBCs. Region III Industrial RBCs were exceeded in three samples (TS-03, TS-11, and TS-17). No other EPA Region III Industrial RBCs were exceeded. The risks and non-carcinogenic hazards associated with a commercial/industrial and construction/utility worker exposure to the contaminants of potential concern (COPCs) in surface soils within the Main Industrial Area due to incidental ingestion, dermal contact, and inhalation of volatile COPCs in indoor air were all calculated. The upper-bound excess cancer risk for exposure to soil for commercial/industrial workers was calculated to be  $3 \times 10^{-7}$  and the total Hazard Index (HI) is less than one (HI=0.02). The upper-bound excess cancer risk for exposure to soil for construction/utility workers was calculated to be  $2 \times 10^{-7}$  and the total Hazard Index (HI) is less than one (HI=0.2). Therefore, the potential for exposure to commercial/industrial and construction/utility workers are minimal.

- **Southern Undeveloped Area:** One sample (TS-03) exceeded the Region III Industrial RBC for Aroclor-1254. Since the only COPC identified in the soil in the Southern Undeveloped Area (i.e., Aroclor-1254) will be removed, the residual risks and non-cancer hazards will be evaluated after completion of the remedial action. Currently, there are no activities occurring in this area which could result in human exposure to the contaminated soils. Soils containing the highest concentration of COPCs were at a depth of three feet.

The risks and non-carcinogenic hazards associated with a construction/utility worker exposure to COPCs in surface and subsurface soil within the Southern Undeveloped Area via incidental ingestion, dermal contact, and inhalation of particulates were all calculated. The upper-bound excess cancer risk for exposure to surface and subsurface soil was calculated to be  $2 \times 10^{-8}$ . Toxicity values based on non-carcinogenic effects have not been established for COPCs, therefore, a non-cancer HI was not calculated. Therefore, the potential for exposure to commercial/industrial and construction/utility workers are minimal.

- **Northern Recreational Area:** No samples collected exceeded the Region III Industrial/Residential RBCs. The risks and non-carcinogenic hazards associated with a commercial/industrial and construction/utility worker exposure to the contaminants of potential concern (COPCs) in surface soils within the Northern Recreational Area due to incidental ingestion, dermal contact, and inhalation of volatile COPCs in indoor air were all calculated. The upper-bound excess cancer risk for exposure to soil was calculated to be  $3 \times 10^{-7}$  for the commercial/industrial worker and  $2 \times 10^{-8}$  for the construction/utility worker. Toxicity values based on non-carcinogenic effects have not been established for the identified COPCs, therefore, a non-cancer HI was not calculated. Therefore, the potential for exposure to commercial/industrial and construction/utility workers are minimal.

**Surface Water:** It appears that impacted groundwater from the former manufacturing area flows radially away from a groundwater mound and discharges to the James River, the unnamed tributary to Wood Creek, the northern tributary to Wood Creek, the mouth of Grices Run, and Wood Creek. Based on available groundwater monitoring data, the concentrations of the COPCs at locations where groundwater discharges to surface water are well below any human health screening criteria.

**Air:** No residences are located within 100 feet of the known contaminated areas. In addition air sampling performed in the former Office Building on-site (Building 203). All detected concentrations were at least two orders of magnitude below OSHA Permissible Exposure Limits (PELs).



**TABLE 1 - SUMMARY OF GROUNDWATER QUALITY RESULTS**  
**December 2002**

<b>Sample ID</b>	<b>Units</b>	<b>PCE</b>	<b>TCE</b>	<b>cis-1,2-DCE</b>	<b>VC</b>	<b>Zinc</b>
Monitoring Well						
BN01	µg/L	66	4.1	5	<5	49,900
BN05	µg/L	860	95	24	<50	31,900
MW101	µg/L	870	230	31	<25	69
MW102	µg/L	0.8	<1	<5	<5	43.7
MW103	µg/L	18	2.8	80	<5	13
MW104	µg/L	1.4	1.2	11	3.1	450
MW105	µg/L	13	1.2	<5	<5	23
MW106	µg/L	34	9.9	1.1	<5	29,000
MW110	µg/L	710	37	49	<25	ND
MW111	µg/L	390	40	38	<25	ND
MW112	µg/L	200	17	17	<5	39.2
MW114	µg/L	74	29	27	<5	ND
MW115	µg/L	360	52	820	<50	5.4
MW116	µg/L	510	260	20	<25	ND
MW117	µg/L	470	1,800	210	<50	ND
MW118	µg/L	710	680	570	24	19.4
MW119	µg/L	830	140	24	<50	16.9
MW120	µg/L	15	6.8	0.8	<5	16.2
MW121	µg/L	8.9	1.4	3.5	<5	6.3

µg/L - micrograms per liter

ND - compound not detected

PCE - Tetrachloroethene

TCE - Trichloroethene

cis-1,2-DCE - cis-1,2-Dichloroethene

VC - Vinyl chloride

**TABLE 2**  
**COMPARISON OF VDEQ TIER II RESIDENTIAL SOIL SCREENING LEVELS**  
**AND EPA REGION III RESIDENTIAL SOIL RBCS**

Constituent of Concern	VDEQ Tier II Soil Screening Level (mg/kg)	EPA Region III Industrial Soil RBCs (mg/kg)	EPA Region III Residential Soil RBCs (mg/kg)
Mercury	0.8	100	7.8
Acenaphthene	63	61,000	4,700
Acenaphthylene	230		
Anthracene	1,300	310,000	23,000
Benzo(a)anthracene	0.87	3.9	0.87
Benzo(a)pyrene	0.087	0.39	0.087
Benzo(b)fluoranthene	0.87	3.9	0.87
Benzo(g,h,i)perylene	230		
Benzo(k)fluoranthene	8.7	39	8.7
Chrysene	87	390	87
Dibenz(a,h)anthracene	0.087	0.39	0.087
Fluoranthene	310	41,000	3,100
Indeno(1,2,3-cd)pyrene	0.87	3.9	0.87
Naphthalene	6.1	20,000	1,600
Phenanthrene	230		
Pyrene	230	31,000	2,300
Arochlor-1254	0.156	1.4	0.32

**TABLE 3**  
**MAXIMUM VOC DETECTIONS AND CORRESPONDING**  
**REGION III INDUSTRIAL AND RESIDENTIAL RBCs**

Compound	Maximum Detected Concentration (mg/kg)	EPA Region III Industrial Soil RBCs (mg/kg)	EPA Region III Residential Soil RBCs (mg/kg)
1,1,1-Trichloroethane	0.0018	290,000	22,000
1,1,2-Trichloroethane	0.0096	50	11
1,1-Dichloroethane	0.062	100,000	7,800
1,1-Dichloroethene	0.088	510,000	
1,2-Dichloroethane	0.015	31	7
1,2-Dichloroethene (total)	1.8	9,200	700
Acronitrile	140	5.3	1.2
Benzene	0.096	52	12
Carbon tetrachloride	0.25	22	4.9
Chloroethane	0.0059	990	220
Chloroform	0.29	10,000	780
cis-1,2-Dichloroethene	1.8	10,000	780
Ethylbenzene	0.0023	100,000	7,800
Methylene Chloride	0.004	380	85
Tetrachlorethane	5.9	140	32
Toluene	0.91	200,000	16,000
trans-1,2-Dichloroethene	0.05	20,000	1,600
Trichlorethene	0.56	7.2	1.6
Trichlorofluoromethane	0.0024	310,000	23,000
Vinyl Chloride	0.013	4.0	0.09
Xylene (total)	0.1	200,000	16,000

## ATTACHMENT 2

A Site Characterization Investigation and supplemental soil investigations have been completed at the facility in order to develop soil and groundwater data necessary to characterize the nature and extent of the constituents present in soil, groundwater, and indoor air at the site.

**Groundwater Quality and Potential Pathways:** Groundwater quality condition have been well documented at the facility (see various groundwater quality assessment and routine groundwater monitoring reports). There is also substantial information available that demonstrates that there is no current human exposure to contaminated groundwater. In addition, there is no potential for human exposure to contaminated groundwater given the absence of surface water discharge of constituents and the high level of segregation between the shallow groundwater unit at the site and the much deeper aquifer.

**Surface Soil Quality and Potential Pathways:** There is environmental quality data available for surface soils at the facility. Data from a soil characterization study of the Main Industrial Area indicates that Aroclor-1254 was detected in several shallow soil samples (0-1 ft.) which exceeded the Region III Industrial RBCs for soils. However, currently there are no industrial, maintenance or utility activities occurring in this area. In addition, the entire facility is enclosed by a chain-link fence equipped with triple strands of barbed wire and a security guard is posted at the gate to limit access to the site. Therefore, currently, there is no potential for exposure.

**Surface Water Quality and Potential Pathways:** Potential exposures to surface water would be limited to the worker and trespasser scenarios; however, it is highly unlikely that either a worker or a trespasser would come into contact with areas where groundwater discharges to surface water.

**Subsurface Soil Quality and Potential Pathways:** As with the evaluation of surface soil quality, the extent of affected subsurface soils is expected to be limited. Potential exposures are expected to be limited to construction workers, and would be sporadic in nature, if they would occur at all. The potential for exposure of construction workers to constituents associated with windblown soils can be readily controlled through dust suppression measures. Any remedial actions undertaken at the facility will be performed by qualified trained workers following an approved plan. The entire facility is enclosed by a chain-link fence equipped with triple strands of barbed wire and a security guard is posted at the gate to limit access to the site. As a result, exposure to contaminated subsurface soils are not expected to be a significant issue at the facility.

### **ATTACHMENT 3**

As described in Attachments 1 and 2, the extent of hazardous waste constituents in the various environmental media is extremely limited in nature. Potential exposure pathways are generally limited to plant employees who are not expected to be present in affected areas on a routine basis, or who would be present in vehicles or equipment. Exposure of plant employees to constituents associated with windblown soils is controlled by pavement in potential source areas. The entire facility is enclosed by a chain-link fence equipped with triple strands of barbed wire and a security guard is posted at the gate to limit access to the site. Other potential exposure scenarios are the trespasser and construction worker; potential exposures under either of these scenarios are expected to be extremely limited in nature based on control of the property, and the infrequent occurrence of construction activities.